

A New Subspecies of Incisalia henrici (Grote and Robinson) (Lepidoptera: Lycaenidae) from the Outer Banks of North Carolina *

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ABSTRACT. A new subspecies of Incisalia henrici (Grote & Robinson) is herein described from resident populations of this butterfly occurring on the North Carolina Outer Banks. These populations contain a high predominance of adult individuals which display a combination of three distinct greenish ventral characters, and one dorsal character.

INTRODUCTION

Populations of Incisalia henrici (Grote & Robinson) from eastern North Carolina and the Chesapeake Bay region of Maryland, Delaware and Virginia display a tendency for development of greenish characters on the ventral wing surfaces. This tendency is strongest in populations along the North Carolina Outer Banks, which is herein designated as the type locality (TL) of the new subspecies Incisalia henrici viridissima described below. There, strongly-greenish phenotypes predominate. A smaller percentage of TL adults, which I consider to be intermediates to nominotypical I. h. henrici, display one or two of three basic greenish characters. A very small number of brown adults resembling the nominotypical form do occur here, but there are still minor differences.

HISTORY

The greenish I. henrici phenotype went virtually unnoticed until 1983, prior to which there was no literature reference. Even now, very little has appeared in the literature about greenish characters in I. henrici. Samuel Gifford was the first person known to have studied the Outer Banks population of I. henrici. Gifford observed this population during the years 1974-1980, but did not publish his findings for several years. In a paper on the biology of several hairstreaks (Gifford & Opler, 1983), the authors very briefly stated: "Individuals of the Hatteras Island population had a greenish cast ventrally, and might eventually be described as a separate subspecies...". Later, in Opler & Krizek (1984), it was briefly mentioned that "in populations [of I. henrici] from North Carolina's Outer Banks most individuals have strong green highlights ventrally". Subsequent inquiries with various sources led me to conclude that Samuel Gifford had been the only real authority on the green phenotype, though there was no indication that he intended to publish a paper on the subject. Gifford was the source of most I. h. viridissima specimens in several collections which I examined.

* This article was critically reviewed by two anonymous peers and at least one member of the MES Editorial Committee.

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DIAGNOSIS

A combination of four characters distinguish I. h. viridissima from the nominotypical subspecies and all other described subspecies and forms of I. henrici: a nearly uniform dark (fuscous) brown dorsum; ventral basal green dusting; ventral postmedian greenish tint; and ventral postmedian greenish iridescence. These characters were not specified in the original descriptions of nominotypical I. henrici (Grote and Robinson 1867), subspecies I. h. margaretae (dos Passos 1943), I. h. solata (Cook and Watson 1909), or I. h. turneri (Clench 1943), and have not been mentioned as occurring in another as yet undescribed subspecies from the southeastern U.S. (Gatrell 1985).

DESCRIPTION

All color names in parentheses are from: "Color Standards and Color Nomenclature" (Ridgeway 1912).

Incisalia henrici viridissima, new subspecies (Figs. 1 and 2).

Wing shape, tails, scalloping as in nominotypical henrici, though tails average about 0.5 mm longer. Above (Fig. 1), uniform dark (fuscous) brown in the vast majority of individuals, often with a brassy sheen, shaded very diffusely over the postmedian portion of the primaries in some females, and in rare individuals also on the secondaries, with a faint rusty (Sanford's) brown. Also, in the submarginal portion of secondary wing cells CuAl and CuA2, before the anal angle of the hindwing, a bright rusty (Sanford's) brown patch in both sexes. Rarely, this rusty area extends into cell M3, more likely in females. The fringes on the primaries and on the forward portion of the secondaries are light, rarely whitish, but more often pale brownish or greyish, and occasionally very dark, and are interrupted at the veins which are tipped with blackish. Toward the anal angle of the hindwing, the fringes are usually dark.

The venter is characterized by three major green characters in combination: (1) The variable presence of green dusting on the basal half of the secondaries. Less frequently, this dusting is also present on the primaries, along the costal portion of the basal half. Rarely, the entire underside is covered with greenish peppering. (2) A greenish tint along the postmedian half of the secondaries and also in the subapical portion of the primaries. (3) Greenish iridescence along the postmedian half of the secondaries and also in the subapical portion of the primaries. A full description follows:

Beneath (Fig. 2), the primaries are of a variable (snuff to sayal) brown from the base outward to the long dark brown postmedian transverse line at the apical third running over the veins and extending from the costal margin to CuA2. There is also a very small dark brown transverse line or dash about halfway along the costal margin of the wing extending from vein M1 inward to vein M3, being curved very slightly, with concave side facing toward the base. Outside of the postmedian transverse line, the submarginal third of the wing is paler toward the apical portion, being of a greenish (variably serpentine

green, yellowish citrine, oil green, lettuce green, warbler green or pyrite yellow) brown. There is a row of subdued dark brown submarginal spots, usually present and centered in cells M₂, M₃, and CuAl, but variably present and fading in the cells toward costal and inner margins. There is also a row of subdued dark brown marginal spots, usually present in cells CuA₂ to M₂, but fading toward the apex. The fringes are as on the upper surface.

In the secondaries, the base is dark (maroon to bay) brown, paler (like the adjacent primaries) along the lower costa, and limited outwardly by the median line; this portion of the wing is sparsely clothed with pale and longer hairs, except on the costal region outwardly, and is very variably peppered with green scales. The median line is essentially the edge of the basal dark area, free of green scaling, and appears dark (maroon to bay) brown. It is shaped as in nominotypical L. henrici, being very jagged, and is succeeded by faint white scales. The white scales increase to become small white median dashes across cell Sc+R₁ and cell IA+2A. Outside the marginal line, in the inner postmedian area, the wing varies from a pale (Dresden brown, light brownish-olive or Saccardo's umber) brown to greenish (variably serpentine green, yellowish-citrine, oil green, lettuce green, warbler green or pyrite yellow) brown. Extreme individuals are strongly (olive-yellow to light yellowish-olive) green. This greenish area displays a green iridescence, strongest in natural sunlight. There is a jagged postmedian row of undulating semilunate, black, inter-space crescents as in nominotypical L. henrici, edged inwardly by very faint white scales, which are often obliterated. Beyond these crescents, toward the apical third, the submarginal space is quite variably pale (snuff to sayal) to dark (maroon to bay) brown to greenish as in the inner postmedian area. In the remaining (tornal) two thirds of the submarginal space is a hoary, greyish, violet blue hue. Toward the inner part of this hoary zone, is a subdued pinkish shade which parallels the postmedian crescents, and is strongest immediately outside each crescent. There is a narrow, interrupted, black internal marginal line, bordered in the extreme external margin by a dark (maroon to bay) brown line. The fringes are as on the upper surface.

Interestingly, the ventral green coloration on the outer third of the wings seems to fade somewhat with age in most specimens, though the basal green scales of the secondaries retain color, and the postmedian iridescence remains. Optimally, one should examine specimens under natural sunlight to view the full effect of the green characters in combination {individuals observed resting in full sunlight often appear fully-green, occasionally not unlike the Olive Hairstreak, Mitoura grynea (Hübner) owing to strong iridescence in natural light}. Incandescent and fluorescent lighting do not reveal true color as seen in nature. Specimen dispatching and relaxing fluids generally destroy all green characters. Thus, the disappointment of several colleagues who claim to have captured striking viridissima-like individuals in blend zone locations, only to find their voucher specimens' green features quite subdued under artificial light.

The head and body are dark (fuscous) brown, with a covering of long hairs. This covering of hairs is generally thickest on the head and thorax, and more sparse on the abdomen. The antennae are black, strongly annulated with white rings, and the club is dark (fuscous) brown to blackish. The palpi are greyish-brown to blackish. The eyes are

very narrowly margined with white. The legs are greyish, variably ringed with white. Forewing length along the costal margin ranges from 11.0 mm to 15.0 mm, average length is 13.0 mm, with 50% of all examined specimens measuring 13.0 mm.

Intermediates from the Outer Banks and blend zone generally fit the description of *L. h. viridissima*, except that only one or a combination of two of the green characters are expressed. Fully-brown individuals from the Outer Banks resemble *L. h. viridissima* in all respects, except that they lack any of the three green characters. These are slightly larger than northern (nominotypical) and inland populations, are somewhat paler beneath, generally dark above (compared to nominotypical populations which display variable degrees of dorsal rusty brown), and have minutely longer tails.

ETYMOLOGY

The subspecies name comes from Latin "viridissima", which means "the greenest of all" *L. henrici*. If deemed necessary for future purposes, I propose that the name "Greenish Henry's Elfin" be applied as the common name. This name is currently widely used by local lepidopterists.

RANGE

The type locality (TL) of *L. h. viridissima* is Bodie Island lighthouse, near Oregon Inlet, Nag's Head, Dare Co., NC (Fig. 5). This location lies within Cape Hatteras National Seashore. There are also records from the Frisco and Buxton Woods area north to Kitty Hawk, all on the Outer Banks. This small area comprises what I consider the range of true subspecies *L. h. viridissima*, though it may eventually be found that similarly high percentages of the green phenotype may occur in yet undocumented populations further north and south along the barrier beaches and also inland at some locations.

There is a broad inland blend zone (Fig. 5) in which most individuals are predominantly brown, somewhat resembling nominotypical *L. h. henrici* (Fig. 3), but differing from the nominotypical phenotype in having a somewhat lighter brown ventral ground color, a darker dorsal surface color [generally lacking the extensive orange-brown coloration found on the dorsal wing surfaces of northern (*L. h. henrici*) and midwestern (*L. h. turneri*) populations], and in being slightly larger. In these populations, individuals intermediate to *L. h. viridissima* are frequent to varying degrees (usually <10% in examined series, but as high as 50% in populations from Anne Arundel Co., MD), displaying one or two of the greenish characters. There is also a presence of strongly greenish viridissima-phenotype individuals (usually <5% in examined series) that are virtually indistinguishable from TL specimens. The currently-known distribution of the *L. h. viridissima* phenotype and intermediates on the mainland extends west only to Craven Co., NC, north around the west side of the Chesapeake Bay over to the WV and western MD panhandles, into southern

Maryland, the Delmarva Peninsula, and southern NJ. Scott (1986, plate 332) shows a photograph of what appears to be a slightly intermediate specimen from central NJ.

Beyond the blend zone, from PA and northern NJ, northward into New England, and westward into WV, populations are nominotypical *L. h. henrici*. Specimens from much of VA and NC were not available for examination. Populations from southern NC, south into SC and GA, over into MS (Mather 1958) constitute a weak southern subspecies (Gatrell 1985), which grades somewhat into the FL subspecies *L. h. margaretae* (dos Passos 1943), but also displays some intrinsically unique characters. This subspecies is characterized mainly by less contrast in ventral markings, and by a wine-brown ventral ground color. The dorsum is primarily dark greyish brown. Specimens that I have seen from coastal SC (Fig. 4) are somewhat larger than *L. h. viridissima* and nominotypical *L. h. henrici* specimens, and are also larger than *L. h. margaretae* specimens which I have examined. The tails are intermediate in length between *L. h. margaretae* and all other *L. h. henrici* populations.

The midwestern subspecies, *L. h. turneri* is also a very weak subspecies, based primarily on the strongly orange-brown dorsum. Turneri-like individuals are frequent throughout the Appalachians and as far east as Rhode Island and eastern Ontario. Populations in the southern Appalachians and states west to the Mississippi River cannot be considered true nominotypical *L. h. henrici*, but include a broad range of intermediates and extremes ranging from nominotypical *L. h. henrici* to *L. h. turneri*, with some individuals resembling the unnamed southeastern subspecies. Interestingly, a series of specimens from the extreme eastern Ozarks of Missouri appears uniformly much more like nominotypical *L. h. henrici* than any I have seen outside of the northeastern states. These are generally very small with a predominantly dark dorsum and a dark greyish-brown venter.

Reports of occasional *viridissima*-like specimens in *L. h. turneri* populations in the midwest (Kral, Wright, pers. comm.) with greenish venters, need confirmation. There is nothing in the literature regarding greenish specimens from the midwest, nor have I personally seen any specimens in examined collections. Any *viridissima*-liked specimens in *L. h. turneri* (strongly orange-brown dorsum) populations would not be considered *L. h. viridissima* unless their dorsum were dark. If *viridissima*-like individuals can be confirmed to occur in midwestern populations, then we would see an interesting situation parallel to that of the Falcate Orange Tip, *Anthocharis midea* (Hübner). The nominotypical population, *A. m. midea*, occurs in coastal SCa and GA, with a very narrow blend zone inland to subspecies *A. m. annickae* (dos Passos and Klots), which essentially occupies the remainder of the species' range from New England west to Nebraska and south to Texas. However, individuals strongly resembling nominotypical *A. m. midea* appear in populations in Nebraska and Missouri (personal observations), occasionally comprising the majority of individuals at some locations.

HABITAT

The type locality colony is located in a maritime thicket habitat at the leeward fringe of a large stand of mature loblolly pine (Pinus taeda). These tall pines provide a natural windbreak, sheltering the habitat from the relentless pruning effect of onshore winds and salt spray, which would otherwise limit the height of associated trees and shrubs to a low, dense, windswept canopy. Small butterflies such as L. henrici are not known to inhabit such windswept environments. The trees and shrubs along the lee side of the protecting pines, however, are taller than in the dense windswept shrub thicket which occurs closer to the ocean. Some of the resident shrubs have attained small tree size, thus contributing to the windbreak effect. Ocean breezes are thus tempered in the primary habitat, allowing for considerable solar radiation in the spring. This warming effect is most perceptible during cool, windy spring mornings in sunlit places along the pine forest edge, and in clearings in the protected maritime thicket.

Associated prominent woody plants in this protected maritime thicket are: eastern red cedar (Juniperus virginiana), highbush blueberry (Vaccinium corymbosum), American holly (Ilex opaca) and black cherry (Prunus serotina), which are found primarily in open areas. Yaupon holly (Ilex vomitoria) and waxmyrtle (Myrica cerifera) both occur in open areas, but also beneath the loblolly pine canopy, and form a dense perimeter along the pine forest fringe, most noticeable along the maintenance-area service road. Loblolly pines also grow out in the thicket, as smaller trees. Greenbrier (Smilax spp.), forms impenetrable tangles in all areas, which impede movement of larger animals.

Additional specimens were collected over several years by various people in separate wooded habitats on the Outer Banks. Numerous specimens have been taken at Frisco and Buxton Woods (in areas outside the National Seashore) where L. vomitoria is common in areas bordering the forest habitat, but no large concentrations of the butterfly have been found. Part of Buxton Woods lies within the National Seashore, while part remains unprotected and may be subject to increasing development pressure in future years. Additionally, a small population exists in what I consider "mainland" habitat in the barrier island woods near the Wright Memorial Bridge.

On the mainland, L. h. viridissima blend zone populations are associated with dense stands of American holly (Ilex opaca) in mature pine or hardwood (oak-dominated, mainly) woodland. These populations can be extremely abundant during some years, almost swarming about host trees in some locations.

HOSTS

Yaupon holly (L. vomitoria) - Gifford and Opler (1983) reported that the Hatteras Island population utilizes only yaupon holly, ovipositing adjacent to the midrib on the upper surface of the previous year's leaves. In 1991, I found one ovum on the upperside midrib of an older leaf, near an unopened new bud. The southeastern subspecies also utilizes yaupon holly along the South Carolina coast.

American holly (I. opaca) - Gifford and Opler (1983) reported that only American holly was used on Roanoke Island. However, in 1991, I discovered a small tree at the TL that was frequented by several females. Close examination revealed that several ova had been deposited on prominent leaf buds at the tree top, as well as on upper leaf surfaces (old leaves) on prominent upper branches. One ovum was found on a leaf undersurface, near the leaf edge. American holly is also the main host of blend zone populations around the Chesapeake Bay and also of nominotypical I. h. henrici populations at Sandy Hook and Batsto, NJ, and in southern RI. Gatrell (1985) reported American holly as the hostplant of the southeastern subspecies, in South Carolina.

Two captive females from the barrier strip woods near the Wright Memorial Bridge were confined on a sleeved American holly in lab conditions. Numerous ova were deposited over a 14-day period, mainly on fresh leaf buds, but also on leaf stems, end twigs, and on the previous year's leaves. After two weeks of feeding on American holly, the larvae were transferred to young redbud (Cercis canadensis) leaves, due to a shortage of available holly in prime feeding state, in the area of my residence in central Maryland at that time. They only nibbled on the leaves at first, finally accepting them after about two days. The larvae developed normally and formed pupae (100+), which were refrigerated for approximately 5 months. After removal from refrigeration, only 5 adults emerged, two of them aberrated. The remaining pupae did not break diapause and were returned to refrigeration for an additional 3 months, after which time all were determined to be dessicated. Wright (pers. comm.) suggested that perhaps C. canadensis may not be an optimum foodplant for I. h. viridissima, resulting in the high mortality rate in the rearing experiments. Further work is needed here. American holly-associated females from Prince George's Co., MD (western Chesapeake blend zone) would not oviposit on redbud in captivity, but freely oviposited on American holly. Redbud is the predominant host for nominotypical I. h. henrici populations in the central and southern Appalachian region, and for midwestern I. h. turneri. Populations centered in the eastern West Virginia panhandle, which contain a small percentage of viridissima-like individuals and intermediates, also seem to be associated with redbud. Very little is known about host preferences around Philadelphia, PA, the species' TL. Redbud may be the primary host there. Shapiro (1966) reported wild plum (Prunus pennsylvanica) as a host in parts of eastern PA. This host occurs in moderate numbers in the Philadelphia area, though Wright (pers. comm.) felt that plum is rarely used in Pennsylvania.

HABITS

These adults are among the first butterflies to emerge in early spring, generally flying with the Spring Azure, Celastrina ladon (Cramer). The earliest records from the Outer Banks are March 24 (Ferguson), but worn condition of some adults from around this time indicate that the flight period may begin sometime in mid-March, with numbers peaking around April 1. Latest records are from April 17 (Gifford). Yearly emergence patterns are likely to be highly dependent on varying weather conditions.

Earliest emergence in inland (blend zone) populations, immediately west of the Outer Banks, definitely occurs in early to mid-March (Sullivan, pers. comm.). To the north, in the broad blend zone around the Chesapeake Bay, the first emergences occur in early April, with numbers peaking in mid-April, but this situation is also highly dependent on seasonal conditions from year to year.

The daily flight period at the TL, depending on weather, begins at about 10:00 AM (11:00 AM Daylight Savings Time). Peak activity continues for about two hours, then suddenly drops off. Adults are closely associated with host trees or shrubs in the protected sunlit microclimate of the maritime thicket, usually conducting most activity on, about, or near the hosts. At the TL, L. h. viridissima adults generally prefer abundant stands of yaupon holly along the forest fringe, but also occur out in the protected maritime thicket where larger host shrubs occur in bunches. Males and females perch on prominent branch ends, flying out at other individuals and engaging in territorial aerial displays, then returning to the same perch or a nearby one. The major inland host, American holly, is not very common at the TL, but females have been observed ovipositing on upper branches of one of these trees here. Adult L. henrici avoid the shade of the loblolly pine canopy, but an occasional individual has been seen frequenting sunlit hosts just inside the loblolly pine canopy. Observations recorded in Cape May Co., NJ (blend zone), indicate that adults revert to nectaring and mating activity about flowering highbush blueberry (V. corymbosum) shrubs in the early afternoon. Adults have been found resting on pines near Buxton Woods in late afternoon, but were otherwise inactive (Ferguson, pers. comm.).

In mainland (blend zone) locations, L. henrici adults are active in dense understory stands of host American hollies in forested habitats during the early spring, when the predominant oaks have not yet leafed out. Here, American holly enjoys full sunlight beneath the leafless early-spring forest canopy.

Adults have been observed nectaring on flowers of black willow (Salix nigra) (Zeligs, pers. comm.), highbush blueberry (V. corymbosum), sassafras (Sassafras albidum), wild black cherry (P. serotina), and also reportedly other coastal Prunus spp. One adult has also been sighted imbibing moisture from wet sand (Grooms, pers. comm.).

DISCUSSION

I believe the greenish characters found in L. h. viridissima are an early-stage evolutionary adaptation to the evergreen holly forest habitat in the mid-Atlantic coastal region. This would seem to support the phyletic gradualism model of macroevolution, in which established populations slowly change over a long period of time, adapting to environmental influences. Individuals with strong greenish coloration might gain protective advantage by blending imperceptibly against a background of green holly leaves in early spring. Inland populations, which have a predominantly brown venter and feed primarily on redbud (Cercis canadensis), do not stand to gain from such coloration against the stark leafless dark brown branches of their early-spring forest habitat. Theoretically, the green characters in holly-feeding populations of L. h. henrici may have been selected over time, providing an effective measure of camouflage.

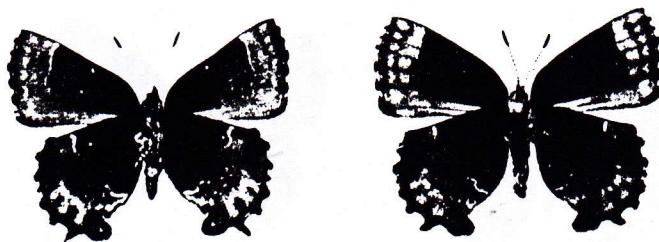


Figure 3. Left side: L. h. henrici, ventral view, male, 29-IV-88, West Kingston, Washington Co., RI; Right side: L. h. henrici, ventral view, female, 29-IV-88, West Kingston, Washington Co., RI.

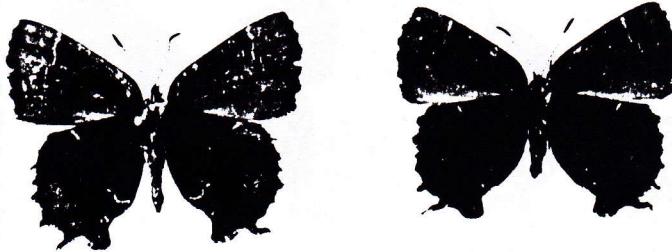


Figure 4. Left side: L. henrici, southeastern subspecies, ventral view, male, 27-III-86, near Beaufort, Beaufort Co., SC; Right side: L. henrici, southeastern subspecies, ventral view, female, 26-III-86, near Beaufort, Beaufort Co., SC.

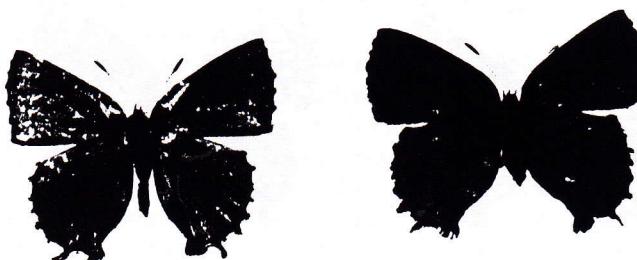


Figure 1. Left side: L. h. viridissima, dorsal view, holotype male, 3-IV-91, Bodie Island lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC; Right side: L. h. viridissima, dorsal view, allotype female, 3-IV-91, Bodie Island lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC.

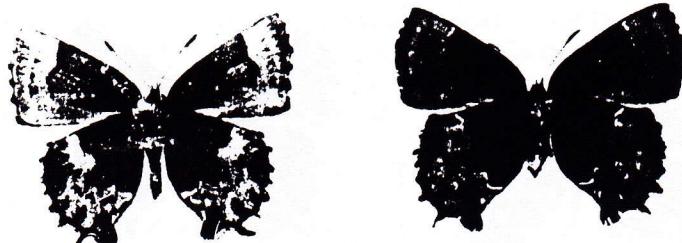


Figure 2. Left side: L. h. viridissima, ventral view, holotype male, 3-IV-91, Bodie Island lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC; Right side: L. h. viridissima, ventral view, allotype female, 3-IV-91, Bodie Island lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC.

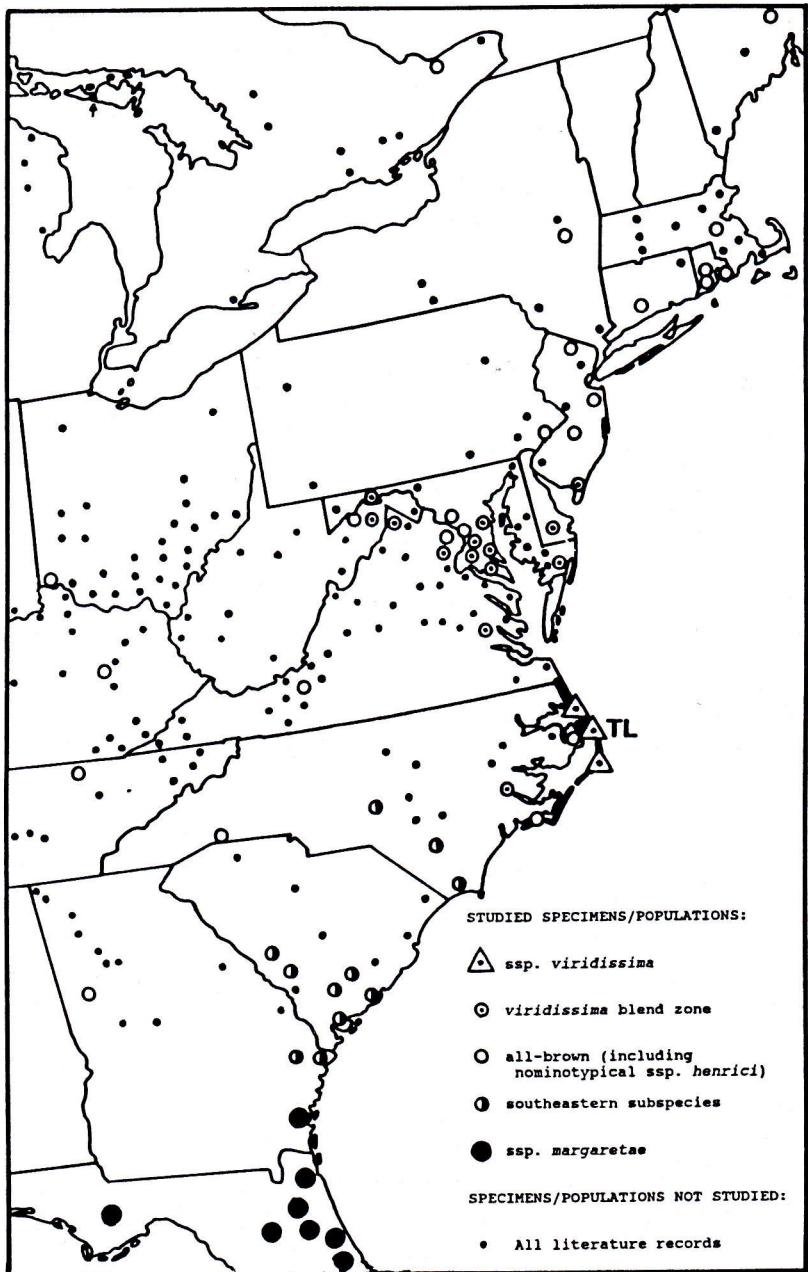


Figure 5. Distribution of *Incisalia henrici* phenotypes in eastern North America showing collection locations of specimens examined. Dots showing literature records from the eastern United States are from Opler (1983). Dots showing literature records from eastern Canada are from Holmes, *et. al.* (1991).

Table 1. General distribution of four eastern *Incisalia henrici* phenotypic characters. These characters are explained in the preceding text. The four general phenotypes were: gr = viridissima; int = intermediate to viridissima; br = "all-brown" phenotypes (including nominotypical *I. henrici*); tu = *I. turneri*; and se = southeastern subspecies.

State	County	No. of Specimens of each Phenotype Examined			
CT	New Haven Co.	31	br		
DE	Sussex Co.	5	br	3	int
Wash., DC	- N/A -			2	br
GA	Bryan Co.	4	se		
	Chatham Co.	3	se		
	Coweta Co.	1	se		
KY	Powell Co.	1	br		
MA	Norfolk Co.	28	br		
MD	Allegany Co.	8	br	1	int
	Anne Arundel Co.	95	br	36	int
	Calvert Co.	9	br	1	int
	Charles Co.	40	br	3	int
	Montgomery Co.	1	br		
	Prince Georges Co.	83	br	4	int
	St. Mary's Co.			1	int
	Worcester Co.			1	gr
				2	gr
ME	Penobscot Co.	4	br		
MO	St. Francois Co.	9	br		
MS	Hinds Co.	1	se	1	br
NJ	Burlington Co.			1	br
	Cape May Co.	31	br	13	int
	Monmouth Co.	8	br		
	Passaic Co.	10	br		
NY	Albany Co.	6	br		
NC	Bladen Co.	1	se		
	Brunswick Co.	3	se		

	Carteret Co.	1 br			
	Craven Co.	1 br	1 int		
	Dare Co. (Outer Banks)	1 se	8 br	14 int	55 gr
	Dare Co. (mainland)		1 br		
	Moore Co.	4 se	5 br		
	Polk Co.		1 br		
OH	Brown Co.		1 br		
	Hamilton Co.		5 br		
	Lawrence Co.		1 br		
	Ont., CAN Ottawa				6 tu
PA	Philadelphia		1 br		
RI	Kent Co.		1 br		
	Newport Co.		1 br		
	Washington Co.	9 br			
SC	Aiken Co.	100% se			
	Barnwell Co.	100% se			
	Beaufort Co.	100% se			
	Charleston Co.	100% se			
	Colleton Co.	100% se			
	Dorchester Co.	100% se			
	Orangeburg Co.	1 se			
TN	Scott Co.	3 br			
VA	Fairfax Co.	1 br			
	Frederick Co.	3 br	2 int	1 gr	
	Montgomery Co.	7 br			
	New Kent Co.	28 br		1 gr	
	Prince William Co.	12 br	4 int	1 gr	
WV	Hampshire Co.	10 br	1 int		
	Mineral Co.	2 br			

SPECIMENS EXAMINED

Specimens from the following locations (state, county) were examined to determine the distribution of greenish characters (Table 1). KEY: br = nominotypical and near-nominotypical (all-brown) phenotypes; int = intermediate forms present, displaying one or two of the three greenish characters; gr = I. h. viridissima phenotype displaying all three greenish characters; se = southeastern (brown) subspecies; tu = subspecies I. h. turneri (brown). Incisalia h. margaretae has been omitted from this study (though known counties are mapped for reference purposes), as the distribution is well-documented. Numbers indicate actual numbers of specimens counted. Percentage figures indicate a large number of specimens (20+) were examined from a single location, all of which were of similar coloration, generally brown phenotypes. Data for some South Carolina and Georgia counties also include determinations of the southeastern phenotype from literature (Gatrell 1985) and others (Gardner, pers. comm.). Note: specimens collected by the present author at the TL were done under permit (ref. # A 9015) from the U.S. Dept. of the Interior, Cape Hatteras National Seashore. Copy available upon request.

HOLOTYPE, ALLOTYPE, AND PARATYPE SPECIMENS

HOLOTYPE: male (Figs. 1 & 2), TL = Bodie Island Lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC, 3-IV-1991, Harry Pavulaan, deposited in USNM. **ALLOTYPE:** female (Figs. 1 & 2), Bodie Island Lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC, 3-IV-1991, Harry Pavulaan, deposited in USNM. **PARATYPES:** Paratypes # 1 - 3: 3 males, Bodie Island Lighthouse, Cape Hatteras National Seashore, near Nag's Head, Dare Co., NC, 3-IV-1991, Harry Pavulaan, deposited in USNM. Paratype # 4: female, ex-ovum from Nag's Head, Dare Co., NC; ovum on 12-IV-1991, on I. opaca, larva reared on I. opaca (2 weeks) and C. canadensis (2 weeks), emerged 5-X-1991, collected/reared by Harry Pavulaan. Paratypes # 5 - 8: 4 males, Kitty Hawk, Dare Co., NC, 31-III-85, Harry Pavulaan. Paratypes # 9 - 17: 9 females, Kitty Hawk, Dare Co., NC, 31-III-85, Harry Pavulaan (Note: paratype # 17's original green characters were obliterated due to greasing of wings, and subsequent degreasing with Naptha lighter fluid). Paratypes # 18 - 25: 8 males, Kitty Hawk, Dare Co., NC, 28-III-89, Harry Pavulaan. Paratypes # 26 - 31: 6 females, Kitty Hawk, Dare Co., NC, 28-III-89, Harry Pavulaan. Paratype # 32: male, brown form, Kitty Hawk, Dare Co., NC, 28-III-89, Harry Pavulaan. Paratype # 33: male, Kitty Hawk, Dare Co., NC, 7-IV-93, Harry Pavulaan. Paratype # 34: male, ex-ovum from Nag's Head, Dare Co., NC, ovum on 31-III-91 on I. opaca, larva reared on I. opaca (2 weeks) and C. canadensis (2 weeks), emerged 20-X-91, collected/reared by Harry Pavulaan, sent to John Emmel. Paratype # 35: male, ex-ovum from Nag's Head, Dare Co., NC, ovum, 31-III-91 on I. opaca, larva reared on I. opaca (2 weeks) and C. canadensis (2 weeks), emerged 3-X-91, collected/reared by Harry Pavulaan, sent to John Emmel. Paratypes # 36 - 43: 8 males, Buxton, Dare Co., NC, 14-IV-79, collection of Joseph Zeligs. Paratypes # 44 - 45: 2 females, Buxton, Dare Co., NC, 14-IV-79, collection of Joseph Zeligs.

Paratypes # 46 - 47: 2 males, Nag's Head, Dare Co., NC, 31-III-93, collection of Bill Grooms. Paratypes # 48 - 61: 14 males, Frisco, Dare Co., NC, 25-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 62: female, Frisco, Dare Co., NC, 25-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 63: sex undetermined (abdomen missing), Frisco, Dare Co., NC, 25-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 64: male, right-side aberrant, Frisco, Dare Co., NC, 25-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 65: female, Frisco, Dare Co., NC, 24 -III-75, Douglas C. Ferguson, CMNH collection. Paratypes # 66 - 68: 3 males, Frisco, Dare Co., NC, 26-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 69: male, Frisco, Dare Co., NC, 28-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 70: male, brown form, Frisco, Dare Co., NC, 28-III-75, Douglas C. Ferguson, CMNH collection. Paratype # 71: female, Hatteras Island, Dare Co., NC, 17-IV-71, Sam Gifford, CMNH collection. Paratypes # 72 - 73: 2 males, Hatteras Island, Dare Co., NC, 17-IV-71, Sam Gifford, CMNH collection. Paratypes # 74 - 76: 3 males, brown form, Hatteras Island, Dare Co., NC, 17-IV-71, Sam Gifford, CMNH collection. Disposition of Holotype, Allotype, and Paratypes # 1 - 3 as stipulated in U.S. Dept. of the Interior collecting permit (ref. # A 9015).

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Male HOLOTYPE dorsal view

Ref: Figure 1. left side

April 3, 1991

TL: Bodie Island Lighthouse

Cape Hatteras National Seashore

near Naggs Head, Dare Co., North Carolina

Male HOLOTYPE ventral view

Ref: Figure 2. left side

April 3, 1991

TL: Bodie Island Lighthouse

Cape Hatteras National Seashore

near Naggs Head, Dare Co., North Carolina



Female ALLOTYPIC dorsal view

Ref: Figure 1. right side

April 3, 1991

TL: Bodie Island Lighthouse

Cape Hatteras National Seashore

near Naggs Head, Dare Co., North Carolina

Female ALLOTYPIC ventral view

Ref: Figure 2. right side

April 3, 1991

TL: Bodie Island Lighthouse

Cape Hatteras National Seashore

near Naggs Head, Dare Co., North Carolina